

Utah Space Grant Consortium  
Lead Institution: University of Utah  
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Consortium URL: <http://www.utahspacegrant.com>  
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## **PROGRAM DESCRIPTION**

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Utah Space Grant Consortium is a Designated Consortium funded at a level of \$575,000 for fiscal year 2012.

## **PROGRAM GOALS**

**Outcome 1:** To demonstrably contribute to the development of the STEM Workforce with programs, projects and activities that are in direct alignment with NASA's stated education strategic goals, missions and with her defined outcomes, objectives and PART measures.

### **SMART Objectives:**

- 1:** Increase the percentage of our Space Grant Fellowships and Scholarships given to female students from an average of 32% in 2005-2009 to 40% in 2010-2014. Increase the percentage of awards to minority students from an average of 27% in 2005-2009 to 30% in 2010-2014. This will maintain greater diversity in our Space Grant program compared to the demographics of the State, where 23% of the students are female and 13% are minorities. This will keep our percentages well above the NCES Digest Statistics, where 22% of the students are female and 11% are minorities.
- 2:** a) Improve the process throughout the Consortium by which Fellowships are announced, applications solicited, applications competitively reviewed, awards made, administered and tracked. Our Consortium web site will be revised to have application links from each of the three research universities: U of U, BYU, and USU, so that student applicants can see the specific requirements set forth from these three affiliate institutions. b) From 2005-2009 we awarded an average of 22 Fellowship awards each year. In 2010 we plan to award 17 Fellowships at the graduate student level. All of these awards will be above

\$5,000 tracking level. The number of Fellowships awarded in 2010 is less than in 2009 due to the total Space Grant funding in 2010 being \$575 K rather than \$785 K in 2009. c) From 2005-2009 students and faculty published an average of 34 scientific reports each year. From 2010-2014 we plan to publish an average of 34/year.

- 3: Each year target at least three project areas to focus Space Grant interdisciplinary research and development selected from [1] space systems engineering (ESMD-spacecraft), [2] life support in space (SOMD-crew health, safety, medical ops), [3] space vehicle propulsion (ESMD-propulsion), [4] remote sensing by optical, infrared and microwave imaging (SOMD-space comm.) in direct alignment with NASA Enterprise priorities.
- 4: From 2005-2009 we awarded an average of 25 undergraduate Scholarships each year. From 2010-2014 we plan to award 29 Scholarships at the undergraduate level each year. Of these awards, 8 will be above \$5,000 and 11 will be below the \$5,000 tracking level.
- 5: Increase the number of research infrastructure minigrants awarded to junior faculty members of our Consortium as an investment in their space-related research and career development. From 2005-2009 we made an average of 2 awards. In 2010 we plan to make at least 5 awards to junior faculty members.
- 6: In 2010 we proposed to fund 11 student internships each year at NASA Centers. In 2012-2014 we propose to award four student internships each year (stipend plus round trip travel) to participate in summer research at NASA centers.
- 7: From 2005-2009 7% of our Space Grant students graduated with STEM degrees and entered the STEM workforce. From 2010-2014 we plan on 9% of our students graduating with STEM degrees and starting their careers in the STEM Workforce. From 2005-2009 16% of our Space Grant students graduated with bachelor degrees and entered graduate school declaring a STEM major. From 2010-2014 we plan on 18% of our students graduating with degrees and entering advanced degrees declaring a STEM major.

**Outcome 2:** To attract and retain students and teachers in the STEM disciplines who have a solid understanding of the subject material.

**SMART Objectives:**

- 8: From 2005-2009 we conducted an average of 9 teacher career development workshops each year. From 2010-2014 we plan to conduct 10/year.

**Outcome 3:** Conduct an Informal Education program to form strategic partnerships and linkages between STEM formal and informal providers leading to an expansion of the nation's future STEM workforce through awareness of the mission of NASA and the promotion of STEM literacy.

**SMART Objectives:**

- 9: From 2005-2009 we supported the activities of 3 informal STEM education partnership collaborative projects each year. From 2010-2014 we plan to support 4 informal educational collaborative projects each year.

- 10: Annually develop 4 sets of informal education standards-based STEM materials to enrich visual and activity experiences by informal education providers. Support satellite facilities that make this material available to teachers.

**Management:**

**SMART Objective:**

- 11: Provide one single point of contact for our consortium, namely Dr. Joseph Orr, Director/PI. Our Education Administrator and Program Coordinator will report directly to Dr. Orr and help facilitate all consortium activities, including reporting, proposal preparation, and responding to NASA's requests.

## **PROGRAM/PROJECT BENEFIT TO OUTCOME (1,2, & 3)**

### **Outcome 1. Development of STEM Workforce**

Lafe Deursch, FY 2012 Utah Space Grant Fellowship recipient, researches the effects of dust deposition of mountain snowpack. He has instruments in the field collecting environmental data every six hours for the past three years and has over 100,000 data values already. The NASA Space Grant fellowship has given Lafe time and motivation to work on entering these data into a structured relational database so they can be archived and shared with other researchers. Lafe and his major professor, Dr. Richard Gill, have been working with Professor Dan Ames of the BYU civil engineering department, to implement the open systems database that Dr. Ames designed. The Gill Lab HydroServer Lite database is now online (<http://gilllabbyu.net63.net/client>) and participants are storing all of the data in the database. The database is registered with the Consortium of Universities for the Advancement of Hydrologic Sciences, Inc. (CUAHSI). A paper has been submitted to *Ecological Informatics* describing our experience as an example for other university labs to follow. The fellowship has been a great benefit to Lafe Deursch and his advisor, Dr. Richard Gill.

The NASA internships offered at The Leonardo science museum have provided not only educational opportunities for floor facilitation interns, but transformative experiences that will last a lifetime. Erika DuRoss, Trustee at The Leonardo, has had the opportunity of helping a NASA intern improve her public speaking and facilitation skills. Because she acquired such excellent facilitation skills, she is now working as a facilitator in The Leonardo "tinkering garage." She is currently going to school in anthropology and through her internship, has gained a passion for engineering and electronics which has influenced her future schooling and career plans. She has gone above and beyond her internship by illustrating and documenting instructions and schematics for many of our cardboard engineering projects in the tinkering garage for future facilitators, museum visitors and educators. Following are two anecdotes directly from internship students at The Leonardo: (1) "I started to see myself improving as an intern and future educator. This internship was very challenging for my generally quiet personality in the beginning but I got better towards the end. I saw myself continually improving which is really all that mattered. I grew more confident the more introductions I did and the more familiar I became with my role as a facilitator for field trips. I also got to see my project complete

and it being used as a guide when creating the *Thinking a Thought* page in the pathways.”

(2) “Working as an education intern was such a rewarding experience for me. I got the chance to study a variety of topics in an interesting way. I learned all about Da Vinci and his creations, water and its importance, prosthetics, engineering, science, DNA, stop animation, and art to name a few. I am so grateful I got the chance to enhance my knowledge and prepare myself for the education workforce. I learned some vital skills such as public speaking, teaching in a way that gets students interested in a topic, creating a lesson plan, learning core curriculum standards, learning how to adapt to a new working environment, summoning large group of student’s attention, etc. The experiences I gained from this internship made me want to teach even more and helped give me the skills to do so.”

## **Outcome 2: Attract and retain students and teachers in the STEM disciplines**

The Clark Planetarium provides professional development experiences to several teachers, including both in-service and pre-service teachers. Many teachers were trained on the existing *Seasons of the Moon Phases* kits that reside with each school district. Other kits were created based on the *Kinesthetic Astronomy* curriculum developed by Cherilynn Morrow and Mike Zawaski. Following is a list of quotes/feedback given by teachers at various school districts throughout the State of Utah.

- “Many students at our school do not get to have exciting experiences concerning science outside of the regular classroom setting. This was a great opportunity to learn more about our universe.” – *Timpanogos Elementary*
- “The interaction and activities fully pulled in the 4-6 grade students. They talked about it for days.” – *South Kearns Elementary*
- “Outreach programs are a tremendous benefit for those of us who live in remote rural areas.” – *Escalante Elementary*
- “We live so far away from Salt Lake City, it is nice to have these programs come to us.” – *Castle Dale Elementary*
- “Thank you very much for traveling so far to our very small rural school. Our students enjoyed it and gained a lot.” – *Grouse Creek School*
- “I loved everything. The presentations really clarified what we have been learning in class.” – *Enterprise Elementary*
- “This was so helpful. Many of the students don’t have access to these activities, so they are inspired to dream bigger.” – *Oquirrh Elementary*
- “The lessons went hand in hand with the core. The students were engaged and learned important concepts. Outreach to rural Utah is so valuable. It is a long day for our students to take a field trip to Salt lake, and very expensive.” – *Bruin Point Elementary*
- “We love the kits you gave the district, more would be awesome!” – *Shadow Valley Elementary*
- “Love the season kits that are available to our district. Thank you!!” – *South Clearfield Elementary*

## **PROGRAM ACCOMPLISHMENTS**

### **Outcome 1: Development of STEM Workforce**

#### **SMART Objectives:**

1. During FY 2012 we awarded 43 fellowships and scholarships. Seventeen of these were awarded to female students (39.5%) and 20 were awarded to minority students (46.5%). We are at our base funding goal of 40% for female students and above our base funding goal of 30% for minority students.

2. A new web site for the Utah Space Grant Consortium went live in August 2012. This site now contains new fellowship and scholarship applications for each of our three research universities. These applications have been implemented to standardize the application process. A review board at each affiliate chooses the recipients. Awards are made, administered, and tracked by each individual affiliate and our Program Coordinator works with each affiliate regularly to maintain the database of all awards and student information to feed into the longitudinal tracking system of the National Space Grant Foundation. In FY 2012, we awarded 20 graduate fellowships (14 PhD, 6 MS) with base Space Grant funding, thus exceeding our objective to use base finding to provide 17 graduate fellowships. All 20 graduate fellowship awards were considered significant in the longitudinal tracking system.

A total of 50 papers were submitted to professional journals, conferences, and symposia or published by our students. Our target was 34 papers per year so we have exceeded our goal. Twenty two papers are being published in the Proceedings of the 19<sup>th</sup> Annual Utah Space Grant Graduate Fellowship Symposium plus a total of 28 professional paper and conference submittals were made to professional journals and institutes appropriate to the relevant scientific or engineering specialty. These included IEEE Geoscience and Remote Sensing Letters, IEEE Transactions on Geoscience and Remote Sensing, Biotechnology, Biotechnology Progress, IEEE on Plasma Science, Proceedings of the 12<sup>th</sup> Spacecraft Charging Technology Conference, IEEE Conference on Electrical Insulation and Dielectric Phenomena, Anesthesia and Analgesia, Society for Technology in Anesthesia, and Anesthesiology, and Lunar & Planetary Science Conference.

3. When awarding fellowships and improving research infrastructure, the University of Utah targeted life support in space; Utah State University targeted space vehicle propulsion and remote sensing engineering technology; Brigham Young University targeted space systems engineering and remote sensing by optical, infrared and microwave imaging. We exceeded our objective of targeting three areas by focusing on all four areas of research that were listed in our objective.

4. We awarded 23 undergraduate scholarship awards in FY 2012. This did not quite meet our goal to award 29 undergraduate scholarships. Due to decreased funding in FY 2012, we did not place as much emphasis on undergraduate scholarships. Of these 23 undergraduate scholarship awards, none were above the \$5,000 tracking level, although we consider four of our awards to be significant due to the financial support for these students being necessary for them to stay in school.

5. Four research infrastructure minigrant awards were given during FY 2012 and an additional two awards are being advertised and planned to be funded in the near future. The following is a list of the research infrastructure minigrant awards: (1) Near-IR STEM research at Brigham Young University, Dr. David Allred, (2) Upgrading of the computational physics laboratory at Weber State University including a specific emphasis on computational astrophysics, Dr. John Armstrong; (3) High altitude balloon program at Utah State University, Drs. Shane Larson and John Sohl; (4) Undergraduate education for technology in the classroom where formal laboratory offerings is not possible, Dr. J.R. Dennison of Utah State University; and (5) Research infrastructure projects at University of Utah have been announced but not yet selected and funded (two planned to be awarded). Therefore, we will meet our goal of awarding at least 5 research infrastructure minigrant awards for FY2012 after all of the awards have been made.

6: We are using FY 2012 funding to support three interns at NASA Centers during the summer of 2013. We have made awards to the following NASA Academy interns: (1) NASA Langley Aeronautics Academy, (2) NASA Marshall Robotics Academy, and (3) NASA Ames Robotics Academy. Our goal was to fund four interns per year, however due to limited funding in FY 2012, we are only able to support three interns during the summer of 2013. The internships being funded include stipends of \$5,000 each and round-trip travel costs.

7: Twenty-five of our fellowship students made their next career steps in FY12 (SG participation supported from FY06-FY12 funds). Seven students are pursuing advanced degrees in STEM disciplines, one student accepted a STEM position at a NASA contractor, twelve students accepted a STEM position in industry, four students accepted STEM positions in academia, and one student went on to a position in a non-STEM discipline. We had 18% of our students graduate with STEM degrees in FY12 (our SMART objective was 9%). In FY12 we had 16% of our students graduate with STEM degrees and pursue an advanced degree with a STEM major (our SMART objective was 18%).

## **Outcome 2: Attract and retain students and teachers in the STEM disciplines**

### **SMART Objectives:**

8: We have conducted eight teacher workshops and plan an additional four teacher workshops making a total of 12 teacher workshops in FY2012. These workshops were held at the following locations: (1) Jordan School District, 17 in-service teachers (September 2012), (2) Alpine School District, 15 in-service teachers (September 2012), (3) Davis School District, 13 in-service teachers (September 2012), (4) Salt Lake School District, 6 in-service teachers (September 2012), (5) Salt Lake School District/University of Utah, 7 pre-service teachers (October 2012), (6) Salt Lake School District/Westminster College, 6 pre-service teachers (October 2012), (7) Alpine School District, 21 in-service teachers (February 2013), (8) Box Elder School District & Promontory Charter School, 4 in-service teachers and 110 pre-service teachers (March 2013). We have scheduled the following upcoming workshops in June 2013 using FY 2012 Space Grant funds: (9) Provo School District, 25 in-service teachers, (10) Emery School District, 25 in-service

teachers, (11) Emery School District, 25 in-service teachers, and (12) San Juan School District, 15 in-service teachers. These workshops were coordinated in conjunction with affiliates Brigham Young University (Duane Merrell) and the Clark Planetarium. The total number of workshops was 12 which exceeded our goal of conducting an average of 10 workshops/year during the 2010-2014 award periods.

### **Outcome 3: Informal Education program to form strategic partnerships/linkages**

#### **SMART Objectives**

**9:** New partnerships were established with Children's Corner Camp, Bennion Learning Center, Time for Families, Discovery Academy, Maria Marisella Academy, Idaho Falls campus tours, Hill Field elementary after school programs, Aviation Granite School District program, Jordan School District Flight Tech Center, Hope of Kids, Odyssey Space Camps, and work base learning internship students. We facilitated more than our goal of four new STEM informal education partnerships this past year as stated in our objective.

**10:** We developed and distributed four sets of educational materials on-line and in hard copy. We met our objective to develop and distribute four sets of STEM educational materials. These educational materials covered the subjects of: (1) meteorites, (2) hot air balloons, (3) CO<sub>2</sub> car drag races, and (4) rocket launchers. Each of these four areas are targeted in our science teacher workshops and teachers are given sets of educational materials in handout form, on-line and in real-world objects, such as meteorites and rocket launchers, in these areas to take back to their classrooms for implementation as they teach.

### **Management**

#### **SMART Objective**

**11:** The organizational structure of the consortium has continued to have one Space Grant/EPSCoR Director/PI and one University Sponsored Projects Office Director as the two formal points of administrator contact with the NASA HQ Space Grant/EPSCoR Office.

## **PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES**

- **Student Data and Longitudinal Tracking:** Our Consortium collects required student data from each student when they apply, when each award is made, and before our annual Fellowship Symposium conducted in May of each year. Since 2009, our Consortium has been utilizing the services of the National Space Grant Foundation for longitudinal tracking. We have continued to work closely with the foundation staff to report all student award information. FY 2012 data includes: Total awards = 48; Fellowship/Scholarship = 43, Higher Education/Research Infrastructure = 5; 46.5% of the total awards represent underrepresented minority F/S funding. During the FY12 program year, seven students are pursuing advanced degrees in STEM disciplines, one student accepted a STEM position at a NASA contractor,

twelve students accepted a STEM position in industry, four students accepted STEM positions in academia, and one student went on to a position in a non-STEM discipline. The remaining students have not yet received the degree that they were pursuing while they received their Space Grant award.

- **Minority-Serving Institution Collaborations:** There are no designated minority-serving educational institutions in Utah. However, Weber State University and Salt Lake Community College have large Hispanic student populations with whom we have joint activities. Also, we collaborate with Hampton University (HBCU) on NASA research projects.
- **NASA Education Priorities:**
  - **Authentic, hands-on student experiences in STEM.** In FY 2012, undergraduate student Austin Wood was supported by NASA Space Grant to work with Dr. Bonnie K. Baxter at Westminster College on the discovery of Great Salt Lake microbes that may be causing toxic mercury to form in the brine or microbes that could be detoxifying mercury. They succeeded in isolating bacteria from mercury-contaminated lake samples, and they are currently testing these bacteria for a tolerance to the metal. Dr. Betsy Kleba and her undergraduate research student Laura Wolf, supported by NASA Space Grant, are working toward answering two broad questions: 1) what kinds of life can be found thriving in extreme environments and 2) how are these life forms (extremophiles) able to survive where most other organisms cannot. By identifying, categorizing, and characterizing the microbial inhabitants of Great Salt Lake, Kleba Lab at Westminster College contributes to the general understanding of the unique metabolic capacities of extremophiles, providing opportunities in fields such as bioremediation, biotechnology, astrobiology, and medicine.

In 2012 Michael Fogarty, a Space Grant fellow, acquired new blower technology and developed a feedback controller for the blower so that it can be used to provide CPR. The use of this new technology to provide CPR in space is one of the lab's primary applications. The data Mike collected this past year enabled the lab to submit the NIH SBIR grant proposal in Apr 2013. Derek Sakata is the junior faculty member that benefits.

A Brigham Young University student in mechanical engineering, Sean Smith, has been studying wave motion in the atmosphere under the direction of Professor Julie Crocket. Such waves can affect weather forecasts and climate predictions. This winter has been especially stormy in particular regions and because of this people are very interested in how accurate forecasts will be. Since Sean's work deals with some of the smaller scale details of the dynamics of the atmosphere, his experimental work has been featured in a BYU online video and KUTV's daily news. He creates very effective videos in the lab that help make understanding and visualizing internal waves easier. Through this visualization of his research the general population has been able to learn about the importance of his work.



- **Diversity of institutions, faculty, and student participants.** Our Consortium made a goal to increase diversity in FY 2011 by targeting more awards to female and minority faculty and students. We have continued this effort in FY 2012 to maintain the same goals set forth. All of our research universities (University of Utah, Brigham Young University and Utah State University) allocated a certain portion of fellowship/scholarship and higher education funding toward this effort. This has resulted in percentages of females awarded to be at our goal and percentage of minority participants to be above our goal in our reporting this year. During FY 2012 we awarded 43 fellowships and scholarships. Seventeen of these were awarded to female students (39.5%) and 20 were awarded to minority students (46.5%). Utah's largest minority sub-population is Hispanic (13% according to 2010 census). In FY2012, we funded three Hispanic students (7%) and have a goal to target this diverse group in Utah more in the future. One program that Utah Space Grant supports that targets the Hispanic group of students is the NASA Space Science Day program put on by the Society of Hispanic Professional Engineers (SHPE).
  
- **Engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise.** A few years ago, the Utah NASA Space grant purchased a 14-pound meteorite to show to teachers attending our Science Teacher Workshops. The response was very enthusiastic and we are now enlarging that program and currently have 12 sets of meteorites which have been or will be placed in strategically located colleges, universities, or State school districts, here in Utah by July of 2013. Our plan is to make two items – a 10-14 pound meteorite and a slab of a meteorite approximately four to six inches in diameter and ¼ of an inch in thickness – available to as many students as possible. The slab, cut with a diamond saw, has been polished and treated so as to show the exquisite and beautiful molecular configuration of the inside of these lead and iron space rocks. There are approximately 330,000 K-6 students in Utah at this time. By making these 12 sets available to the schools, we hope to have between 175,000 and 200,000 students touch, hold, and handle a real meteorite which are probably items left over after the formation of planets and moons and have come to planet earth sometime in the last 2-3 billion years. The meteorites which we are using came from Argentina and were purchased at the Gem, Mineral, and Fossil Show held in Tucson, Arizona every February. All of the institutions which were contacted about having a set in their possession to use in their astronomy, physics, and outreach programs, were very supportive and excited. The recent meteorite that fell in Russia in February, 2013, has increased the interest in meteorites among students and teachers.

Space Grant funding has supported Snow College's portable planetarium program. The Math and Astronomy Department at Snow College takes the portable planetarium to local schools to instruct teachers and students in astronomical concepts that align with the state core curriculum.

- **Summer opportunities for secondary students on college campuses with the objective of increased enrollment in STEM disciplines or interest in STEM careers.** Utah Space Grant supports the annual NASA Space Science Day held on the USU campus. This event is put on by the USU chapter of Society of Hispanic Professional Engineers. While this event targets Hispanic secondary students, students of all ethnicities are invited to participate. Dr. Jake Garn, former NASA astronaut, was the keynote speaker at this event. “During the year, we have so many students drop out because kids think science is too hard or it’s no fun or there’s too much math. We want to increase our numbers coming into engineering and science majors,” said Stefanie Monreal, the president of the Society of Hispanic Professional Engineers at USU. “In order to do that, we have to start them young. We have to get them interested when they are about in middle school so they can take the right classes so by the time they’re done with high school, they’re ready to come into college and get a good science degree.”

Utah Space Grant has continued to support the Empowering Your Tomorrow (EYT – targets 6<sup>th</sup> – 12<sup>th</sup> grade boys) and Expanding Your Horizons (EYH – targets 6<sup>th</sup> – 12<sup>th</sup> grade girls) conferences held annually on the campus of Utah Valley University. The purposes of these conferences are to introduce students to a variety of career choices in hopes of inspiring them to seek higher education and to graduate from college. Role models are also provided in their fields of interest as well as offer resources to parents and educators to help students succeed. Female participants are also introduced to non-traditional careers for women and are encouraged to take math, science and technology classes. These conferences are planned by the Utah Valley University Equity in Education Center.

The Utah Space Grant Consortium provided funding for the AWE+SUM camp, held in June 2012: “Attend Westminster, Explore Science, Use Math.” The summer of 2012 was the 8<sup>th</sup> year for Westminster to host this camp, for girls entering the 8<sup>th</sup> grade. The purpose of the camp is to get girls of this age excited about going to college, and specifically excited about science and math. We have several workshops for the girls: building wind chimes, testing creek water for various properties, learning about geometric shapes, doing computer programming, plus workshops in chemistry and aviation. Girls are targeted from underrepresented populations, especially Native American girls and girls from Title 1 schools.

- **Community Colleges.** Our consortium has three community college affiliates: Salt Lake Community College, Snow College and Utah College of Applied Technology (UCAT). In FY 2012, increased Space Grant funds were distributed to these affiliates and they were involved with higher education programs at their institutions to expand opportunities for students in the STEM fields.
- **Aeronautics research.** The Utah Space Grant Consortium is fully engaged in aeronautics curriculum and applications by staff and students. In FY 2012 we

supported Utah State University higher education programs in ground maintenance and flying aircraft-borne imagers, both optical and radar, for research purposes. The Hill Aerospace Museum, an affiliate of our consortium, promoted aeronautics to teachers and students through camps and workshops. The Hill Aerospace Museum also has an in-service teacher program which provided 32 teachers new ideas for bringing aerospace and STEM into their classrooms. This program is in partnership with the Civil Air Patrol and the Air Force Association. The Hill Aerospace Museum also conducts hands-on activities for field trips from the local school districts tied to the science/math/aerospace core curriculums.

- **Environmental Science and Global Climate Change.** Undergraduate students were supported in FY 2012 to analyze NASA data derived from the TIMED satellite, which specifically addresses the earth-sun energy budget. NASA LaRC has made the multispectral and derived atmospheric data available for over more than a full half-solar-cycle to identify trends.
- **Enhance the capacity of institutions to support innovative research infrastructure activities to enable early career faculty to focus their research toward NASA priorities.** Our consortium increased its efforts to support innovate research infrastructure activities to early career faculty by advertising research infrastructure project funding at our three research universities (University of Utah, Utah State University, and Brigham Young University). As a result, we funded four new projects this past year to help faculty focus their research toward NASA priorities and to help them prepare proposals for additional outside NASA funding. An additional two awards are planned. FY 2012 supported research infrastructure activities included a high altitude balloon program, undergraduate education for technology in the classroom where formal laboratory offerings is not possible, upgrading of the computational physics laboratory with a specific emphasis on computational astrophysics, and near-IR STEM research.

## IMPROVEMENTS MADE IN THE PAST YEAR

The Utah Space Grant Consortium continues to make improvements in our management structure and streamline the processes which make our Consortium function in an effective manner. On September 1, 2012, Dr. Joseph Orr became the new Director of the Utah Space Grant Consortium. Dr. Orr has continued to implement the improvements we set forward in 2011, as part of the process to obtain a new director. These targeted areas for improvement were: (1) we brought our percentages of expenditures in Outcomes 1, 2 and 3 into alignment with the national average for NASA Space Grant Consortia; (2) we revised our management structure, making our consortium more efficient and reducing management costs; and (3) we increased our efforts in the areas of diversity and made our student awards to 40% females and 30% minorities. Through our reported outcomes in FY 2012, we have (1) distributed our resources for Outcomes 1, 2 and 3 into alignment with the national average for NASA Space Grant Consortia; (2) made our management structure more lean and reduced management

costs; and (3) been able to report numbers at or above our targets of 40% females and 30% minorities when awarding fellowships/scholarships and higher education awards.

Another improvement in FY 2012 has been the expansion of review panels and competitive awards within our Consortium when awarding fellowships and scholarships, higher education activities, and research infrastructure projects. Review panels at each of the three research universities (University of Utah, Utah State University, and Brigham Young University) have been expanded and they have developed further criteria for basis of awards. We also established a new Utah Space Grant website in August 2012 which has been very useful in implementing the advertising of opportunities for which students and faculty can apply for.

In March 2012, we set up a new system with our contracts office to improve the subcontracting process with affiliates. We were better able to track the awards to our affiliates and reduce the time it takes to get them the funding upon receipt of award at the prime institution. This new system has improved communications between the lead institution and the affiliate members of our Consortium and we have been able to get the subawards to our affiliates in a timely manner.

We have continued to improve the process of verifying Space Grant and matching funds allocated at each affiliate. Invoices from affiliates for subcontracts have documented receipts and expenses as well as matching funds with each submittal.

During 2012 we changed the official name of the consortium from the “Rocky Mountain Space Grant Consortium” to the “Utah Space Grant Consortium.” This change reflects the current makeup of our affiliates and removes confusion.

## **PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION**

### **Education and Research Universities:**

- (1) University of Utah provides graduate student mentors in life sciences.
- (2) Utah State University provides graduate student mentors in space vehicle propulsion.
- (3) Brigham Young University provides graduate student mentors in remote sensing.

### **Industry:**

- (4) ATK Aerospace Systems provides internship opportunities and workshops for women.

### **Education Institutions:**

- (5) Weber State University delivers a summer outreach program for women.
- (6) Southern Utah University provides undergraduate and graduate student mentors in the STEM fields.
- (7) Snow College is a two-year college which prepares students to go onto a four-year university in the STEM fields; they also work with the K-12 schools within their region.
- (8) Dixie State College is a four-year college which focuses on preparing K-12 teachers in biology and physical sciences in our Higher Education programs.
- (9) Utah College of Applied Technology emphasizes the importance of technical training and improving skills in the workplace today.

- (10) Salt Lake Community College provides mentors for undergraduate minority students in physics and astronomy.
- (11) Westminster College provides a summer program for precollege women students.
- (12) Utah Valley University provides mentoring for physics students to assist K-12 teachers in the STEM fields.

**Government Centers:**

- (13) Idaho National Laboratory provides summer internships for students.
- (14) Space Dynamics Laboratory provides matching funds and internships for students in space vehicle propulsion.
- (15) Hill Air Force Base conducts teacher workshops and also provides tours and information for the public as informal education.

**Outreach Institutions:**

- (16) Clark Planetarium provides teacher workshops and outreach to the community.
- (17) Aerospace Heritage Foundation of Utah/Hill Aerospace Museum provides teacher workshops and public outreach.
- (18) North American Native Research & Education Foundation conducts Summer of Innovation workshops for Native Americans.
- (19) The Leonardo science center provides public outreach and internships.

<p><b>The National Space Grant Office requires two annual reports, this Annual Performance Data Report (APD) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.</b></p>
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